POSTER

A Numerical Investigation of the 1997-1998 Ronne Polynya

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The summer season of 1997-98 marked an unprecedented extent of open water in the southern Weddell Sea, not observed since satellite observations began in the early 1970s. Wind patterns during the summer period (b) tended to be more southerly than in years with typical summer ice coverage (a), leading to the hypothesis that the polynya opened due to ice advection away from the Ronne Ice Shelf and subsequent enhanced melting through the open water-albedo feedback mechanism. The Los Alamos Sea Ice Model, CICE, is run using a bulk forcing data set from the 1980s for model spinup and the control run. Initiation of the polynya by the anomalous wind pattern is investigated numerically by substituting winds from the 1997-98 period for the control winds. While a narrow polynya is present in the control run, it opens considerably with the 1997-98 winds, to the extent observed in the satellite images. If solar radiation flux is not allowed to heat the mixed layer, the sea ice in front of the Ronne Ice Shelf shows some opening but the polynya does not form to the extent observed, demonstrating the important role played by open water-albedo feedback. The mixed layer heat budget analysis shows the predominant balance in these three runs was derived from surface forcing and that the upwelling of heat from the deep ocean was not a significant driving force for the 1997-98 Ronne Polynya. Further analysis of the fresh water budget indicates that the mixed layer salinity increased in areas of open water during the 1997-98 season by as much as 0.5 psu.